

1 CLAIMS:

2 1. A method of forming silicon-doped aluminum oxide,  
3 comprising:

4 co-evaporating aluminum oxide and silicon monoxide; and  
5 depositing at least some of the evaporated aluminum oxide and  
6 silicon monoxide on a substrate to form the silicon-doped aluminum  
7 oxide on the substrate.

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9 2. The method of claim 1 wherein the co-evaporating and  
10 depositing are conducted in a chamber, and wherein there is no O<sub>2</sub>  
11 flowed into the chamber during the co-evaporation and deposition.

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13 3. The method of claim 1 wherein the co-evaporating comprises  
14 thermal evaporation of the aluminum oxide from single crystal sapphire.

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16 4. The method of claim 1 wherein the co-evaporating comprises  
17 thermal evaporation of the silicon monoxide.

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19 5. The method of claim 1 wherein the co-evaporating comprises  
20 ion beam evaporation of the aluminum oxide.

1           6.     The method of claim 1 wherein the co-evaporating comprises  
2 electron gun evaporation of the aluminum oxide.

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4           7.     The method of claim 1 wherein the co-evaporating comprises:  
5 thermal evaporation of the silicon monoxide; and  
6 one or both of electron gun evaporation and ion beam evaporation  
7 of the aluminum oxide.

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9           8.     The method of claim 1 wherein the substrate comprises  
10 silicon.

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12          9.     The method of claim 1 wherein the substrate comprises  
13 monocrystalline silicon.

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15          10.    The method of claim 1 wherein the substrate comprises a  
16 semiconductive material, and further comprising forming a conductive  
17 material on the deposited silicon-doped aluminum oxide; the conductive  
18 material being separated from the semiconductive material by the silicon-  
19 doped aluminum oxide.

1 11. A method of forming silicon-doped aluminum oxide  
2 comprising:

3 forming a vapor mixture of aluminum oxide and silicon monoxide;  
4 and

5 co-condensation of the aluminum oxide and silicon monoxide on a  
6 substrate to form the silicon-doped aluminum oxide on the substrate.  
7

8 12. The method of claim 11 wherein the deposition is conducted  
9 in a chamber, and wherein there is no O<sub>2</sub> flowed into the chamber  
10 during the deposition.  
11

12 13. The method of claim 11 wherein the substrate comprises  
13 silicon.  
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15 14. The method of claim 11 wherein the substrate comprises  
16 monocrystalline silicon.  
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18 15. The method of claim 11 wherein the substrate comprises a  
19 semiconductive material, and further comprising forming a conductive  
20 material on the deposited silicon-doped aluminum oxide; the conductive  
21 material being separated from the semiconductive material by the silicon-  
22 doped aluminum oxide.  
23

1 16. A method of forming a transistor, comprising:  
2 forming an insulating layer of silicon-doped aluminum oxide over  
3 a substrate, the forming the insulating layer of silicon-doped aluminum  
4 oxide comprising:  
5 co-evaporation of aluminum oxide and silicon monoxide;  
6 and  
7 deposition of at least some of the evaporated  
8 aluminum oxide and silicon monoxide on the substrate to  
9 form the silicon-doped aluminum oxide on the substrate;  
10 forming a patterned conductive material over the insulating layer  
11 of silicon-doped aluminum oxide; and  
12 forming a pair of conductive source/drain regions spaced from one  
13 another by the patterned conductive material; the conductive material  
14 defining a transistor gate between the source/drain regions.  
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16 17. The method of claim 16 wherein the co-evaporation  
17 comprises:  
18 thermal evaporation of the silicon monoxide; and  
19 one or both of electron gun evaporation and ion beam evaporation  
20 of the aluminum oxide.  
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1           18. The method of claim 16 wherein the patterned conductive  
2 material comprises a pair of opposing sidewalls, and further comprising  
3 patterning the insulating layer of silicon-doped aluminum oxide to be  
4 coextensive with the sidewalls of the patterned conductive material.

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6           19. The method of claim 16 wherein the patterned conductive  
7 material comprises a pair of opposing sidewalls, and further comprising  
8 patterning the insulating layer of silicon-doped aluminum oxide to be  
9 coextensive with the sidewalls of the patterned conductive material; the  
10 patterning of the insulating layer of silicon-doped aluminum oxide  
11 occurring during the patterning of the conductive material.

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13           20. The method of claim 16 wherein the substrate comprises  
14 silicon.

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16           21. The method of claim 16 wherein the substrate comprises  
17 monocrystalline silicon, and wherein the forming the source/drain regions  
18 comprises implanting conductivity-enhancing dopant into the  
19 monocrystalline silicon.

1           22. The method of claim 16 wherein the substrate comprises  
2 monocrystalline silicon, and wherein the forming the source/drain regions  
3 comprises implanting conductivity-enhancing dopant into the  
4 monocrystalline silicon and through the silicon-doped aluminum oxide.

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6           23. A method of forming a memory device, comprising:  
7 forming a first insulating layer over a substrate;  
8 forming a floating gate over the first insulating layer;  
9 forming a second insulating layer over the floating gate;  
10 forming a control gate over the second insulating layer; and  
11 at least one of the first and second insulating layers comprising  
12 silicon-doped aluminum oxide, and being formed by:

13                   co-evaporation of aluminum oxide and silicon monoxide;  
14 and  
15                   deposition of at least some of the evaporated  
16 aluminum oxide and silicon monoxide to form the silicon-  
17 doped aluminum oxide.

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19           24. The method of claim 23 wherein both of the first and  
20 second insulating layers comprise silicon-doped aluminum oxide.  
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1           25. The method of claim 23 wherein only the first of the first  
2 and second insulating layers comprises silicon-doped aluminum oxide.

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4           26. The method of claim 23 wherein only the second of the first  
5 and second insulating layers comprises silicon-doped aluminum oxide.

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7           27. The method of claim 23 wherein the co-evaporation and  
8 deposition is conducted in a chamber, and wherein there is no O<sub>2</sub> flowed  
9 into the chamber during the co-evaporation and deposition.

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11           28. The method of claim 23 wherein the substrate comprises  
12 silicon.

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14           29. The method of claim 23 wherein the substrate comprises  
15 monocrystalline silicon.  
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